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## THE CLIFF DWELLINGS OF THE CAÑONS OF THE MESA VERDE.

BY

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The Mesa Verde, in whose cañon cliffs and caves an ancient race have left their architectural remains, is a plateau in southwestern Colorado and New Mexico. Its boundaries are roughly defined on the east by a ridge or so-called "hog's-back," which slopes toward Cherry Creek and the Rio La Plata, on the south by the erosion valley of the Rio San Juan, on the west by the erosion district beyond Aztec Spring Creek, and on the north by the Montezuma valley, or plain; properly, the McElmo valley. It rises from 1,000 to 2,000 feet above its base, which has an altitude above the sea of from 7,000 to 8,000 feet. The Cañon of the Rio Mancos completely divides this plateau into two unequal portions, as it extends first southward, then southwestward, and finally in a more westerly direction, leaving to the southwest an irregular quadrangle, whose area is probably about 300 square miles. It is to this portion that special attention is called, as it was here that the writer's observations on cliff dwellings were chiefly made. Its drainage is toward the Mancos, and erosion has produced such an extensive system of cañons through it, that it is now the mere skeleton of a mesa and a perfect labyrinth of gorges. Each of these lateral cañons of the Mancos has its branches and their

subdivisions, which extend in many cases almost to the great northern wall of the mesa that faces the Montezuma plain ; so that the whole interior consists of a series of tongues of flat-topped mesa, green with scrub-oak, piñon and cedar, running out from a rim or base upon its northern border, forming partition walls of varying width between cañons of enormous depth, whose yellow sides rise perpendicularly from the steep-sloped talus at the base. Huge promontories of rock jut boldly out where cañons subdivide, some carved into strange fantastic forms, others squarely built as if abutments for giant bridges to span the chasms which they limit. The views seen in journeying through these cañons, while ever varying in minor details, soon become monotonous from the continued repetition of the greater features. We pass promontory after promontory, cañon after cañon, which so much resemble each other that the mind, failing to keep the preceding variations before it, becomes bewildered and fatigued. Again, the mesa, to the uninitiated, is a perfect maze ; so great are the resemblances between the different branches of the cañons and between the promontories that separate them. From some point of view whence a great area of the mesa can be overlooked, it appears as if the earth had been split into innumerable fissures, as the eye courses over the indistinct outlines of cañon beyond cañon in the distance.

These cañons are all the work of erosion in horizontally stratified rocks of cretaceous formation, chiefly sandstone. The upper strata form an escarpment of yellowish sandstone, harder than the lower strata and about 200 feet in thickness. Directly below it are

much softer sandstones and shales which have eroded more rapidly in some places than others, giving rise to shallow caverns or galleries formed by the overhanging cliff of harder rock as a roof ; while lower strata, that have also been resistant, form the floor, which is usually much narrower than the roof, varying from a few feet up to fifty or sixty, while the overhanging cliff may project from a few feet to more than a hundred beyond the back wall of the gallery. Below, the wall of rock drops off abruptly, or by an irregular series of narrow ledges, for hundreds of feet down to the talus slope. The height of the galleries above the bottom of the valley varies from 500 to 1,500 feet. They vary in size from mere niches of a few cubic feet capacity to galleries more than a thousand feet in length and fifty feet in height and width.

On these narrow ledges, at these dizzy heights, under these overhanging walls, the cliff-dwellers fastened their houses of stone to the rocks like so many swallows' nests. The question is often asked : Why did they build so high ? They built where they found caverns in which to build. Although lower strata exhibit many of these caverns, they are far less numerous and extensive than those under the great escarpment rock.

The cañon bottoms are cut up with the "wash" of former streams, benches have been excavated in the talus, and innumerable lateral *arroyos* intersect the longitudinal stream-beds. Partially disintegrated masses of rock add roughness to the view. Tall, coarse grasses, rushes, sage-brush, tangled vines, willow and cottonwood, make up, chiefly, the vegetation of these bottoms ; while upon the higher slopes and ledges, the scrub-oak

grows in such profusion that some of these cañon walls at a distance appear richly clad in verdure. Indeed, it is this bright-leaved oak, rather than the darker piñon and cedar of the mesa proper, that gives it the verdant appearance which must have suggested the name "Mesa Verde."

These cañons end mostly in amphitheatres which were favorite sites for cliff-towns. In some, the mesa level was reached by a series of benches and intervening slopes, while others slope gradually to the mesa, or produce a valley in it. Some of these valleys extend so far to the north that they give to the northern face of the mesa a serrated appearance. Few cañons have water in them except after showers or the melting of snow. The waters of the few permanent streams are alkaline and usually unfit for man or beast to drink. A spring is a treasure rarely found in the cañons, but hollows worn in the rocks become filled by rain or melted snow and furnish the chief supply to the traveller upon the mesa. Some of these rock excavations are quite large and receive the name of "tanks."

It was the writer's good fortune to visit the region thus briefly described under the guidance of Richard, Alfred and John Wetherill during the summer of 1891, for recreation rather than for the purpose of systematic archæological study. For several years these men have devoted a great deal of time to the exploration of this region in search of cliff-houses and the relics they contain; although not professed archæologists, they have amassed a very large collection of the remains of the cliff dwellers and are in possession of a vast number of observations and facts concerning them. Indeed, no

one knows this part of the Mesa Verde as they do. The upper end of the Mancos Cañon is the usual place which tourists visit to see a few examples of cliff-houses, and the hospitable Wetherill ranch is the proper outfitting place.

Jackson and Holmes, whose contributions constitute almost the only attempt at scientific literature on the subject of cliff dwellings, described the ruins in the Mancos Cañon, but their observations did not extend to the interior region described in this article. In these branch cañons of the Mancos, however, the ruins are far more numerous than in the main cañon ; a discovery of the Wetherills, who informed me that they have examined between 200 and 300 villages or separate groups of houses, in an area of less than twenty by forty square miles. The greater part of these are in the lateral cañons. This region, now so desolate, was once a well-peopled area. While journeying in the saddle through the Mancos Cañon or its wider branches, occasionally, mounds are met with, many strewn with bits of pottery others exhibiting upon slight excavation the remains of adobe or stone walls, some quadrangular, some circular. The base of a distant cliff may reveal a small water-worn recess showing the remains of a wall of stone which closed it in front ; the so-called "cave houses." Looking along the high cañon walls in search of cliff-houses, the inexperienced observer is apt to look in vain. He sees every variety of shade and color in the great yellow and brown rocks, projecting masses of every form, shadows of overhanging cliffs and the dark recesses below them ; but until he has become familiar with the somewhat paler yellow of the artificial walls and their rectangularly

notched appearance, he is apt to pass them by even after a careful search. On spying one of these structures a thousand feet or more above, the problem asserts itself: How did the occupants get up to them? It is finally resolved by the answer: They did not, they came down to them from above. The level mesa top was within one or two hundred feet of them; the cañon bottom perhaps more than a thousand feet below, hundreds of which might be perpendicular or unsurmountable. When built at lower levels, or at the end of a cañon where the slopes permitted, paths and steps leading below are occasionally found, but in most instances the path and steps lead from the house up to the mesa, not down to the bottom. The explorer must adopt the same method if he would work to advantage. He must reach the mesa somehow, and establish himself there as his base for operations. It is only at a few favored points that it is possible to reach the top from the cañon below; such places may have been known to the ancient cliff-dwellers, they certainly are known to the Navajoes and Utes, whose trails here and there serve to indicate a way to the top. Some broken down promontory usually affords the conditions. Zigzagging across the talus slope, the ledges are finally reached, and the horseman is glad to leave the saddle and lead or drive his pony over the rough and nearly upright path, around bold promontories with but a narrow ledge for a footing and across great fissures, forcing him to jump from ledge to ledge. The top reached, the saddle resumed, then comes a ride across the level or rolling mesa at better speed. Dodging under and around the branches of low piñon and cedar trees which form a

sparse forest, clattering every now and then over mounds strewn with pottery—the mesa burial grounds—in time a place for camping is reached. It must be where water can be had. A natural excavation in the rock, to which led a gullied slope that directed water when it rained, held a few barrels of muddy liquid and served us at one of our camps. Leading down to it were well worn steps cut in the solid rock.

In hunting for cliff-houses from the mesa, some projecting point will furnish an outlook up or down the cañon and may expose to view some group of houses. To find the way down to them is a matter, often, of careful searching. Usually at some point of depression where the ledges are broken, a narrow way will be found. Yet, there are instances where a broad and royal path sweeps down around the half circle of an amphitheatre to the ledges on which the town was built. Though steps and niches cut in the solid rock are frequent, examples of a regularly laid stairway are rare; we observed one, however, consisting of fifty or sixty steps, each formed of a heavy block of stone, so well placed that they have resisted the ravages of time better than the walls of the large cliff-town to which they led, now almost completely demolished. Sometimes the houses are absolutely inaccessible; portions of the cliff have fallen, ledges have crumbled away, cutting off all access to what may have once been an easily reached dwelling. Ropes and poles are useful accessories to the explorer if he has the courage and the skill to use them. Fragments of notched poles and other ladder-like arrangements have occasionally been found, which probably made many places accessible that are now out of

reach. Sometimes it is necessary to let one's self down for a considerable distance through great fissures. In the side walls, niches are often found to facilitate the descent and ascent. Again, the only way is over the sloping or rounded face of some smooth rock, here also, niches for the hands and feet are not unfrequently seen. They are not deep, perhaps the rock has worn and left them shallower than when first cut, yet they give a

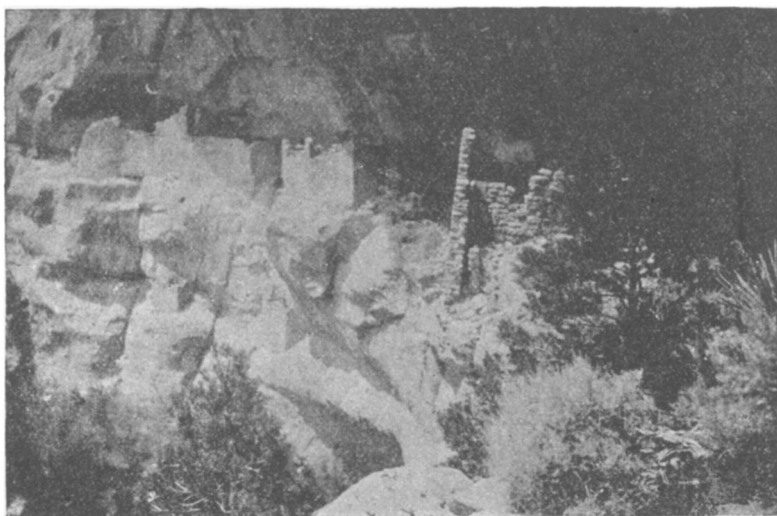


FIG. 1.

foothold, though it be a perilous one. The path may be continued by narrow ledges a few inches in width where the side wall must be closely hugged to maintain equilibrium. Then, possibly a succession of giant steps to lower ledges intervene, and finally, as we round a point, a great cliff curves upward and under its deep shadow, on the ledges below, rise the ruins of a cliff-town.

No description of a single cliff-house can give a correct idea of them as a class, so greatly do they vary in size, form and location. As in every community we have many grades of architecture, from the hovel to the palace, so here, we find a great range in the different features of construction; from the little "cubby-hole" walled up in a corner of the rocks, to the remains of what appears to have been a stately tower or an extensive communal house. Yet all have certain features in common. They are built of blocks of sandstone broken or cut in regular shapes, laid in a cement of adobe and chinked with small fragments of stone. The rock material used was that of the adjoining cliffs, large masses of which fallen from above were usually at hand and sufficiently soft and fragile to have been easily worked with the stone implements found in the houses. The blocks of stone vary greatly in size, though many walls are faced up with stones about a foot long, eight inches wide and six inches thick; others are double or triple this size, some are cubical in shape, while in many of the inferior structures the pieces of stone are irregular, of many sizes and shapes, with adobe plastered into the interstices to fill out the deficiencies. In the more perfect and substantial buildings, however, the walls exhibit great regularity of form and compactness of construction with as true a face as is shown by many of our modern stone buildings. The lines are usually plumb, the corners are turned at perfect right angles in squarely built houses, while in round structures the circles are quite perfect. A remarkable degree of skill is shown by the manner in which the shapes of the buildings were adapted to the limitations of space, which the galleries

presented and in the utilization of every available surface. Many of the walls of large buildings rise directly from the extreme edge of the ledge, sometimes even when the slope to the front was considerable, yet so thoroughly were they laid, that many of them stand to-day on these apparently unstable foundations in a good state of preservation. Where curves in the gallery ex-



FIG. 2.

isted, the walls were also curved or angled to utilize all the space.

In some of the more spacious caverns a continuous corridor was left in the extreme rear, allowing communication between the separate apartments. On narrow ledges, the partitions were carried directly back to the cliff walls and up to the roof of the cavern, provided

the latter was not too high. Four stories upward from a single ledge was the highest that came under the writer's observation. As the stories are low, from three to six feet, it is not usual to find walls running higher than twenty or twenty-five feet; ordinarily they are not so high. When a lower ledge existed in front of the main gallery ledge, it was often built upon and the walls were carried up to the level of the latter and sometimes above. As these outer structures have not stood as well as the inner ones, it is not possible to say from their ruins how high they were built. When supplementary ledges existed high above the main floor, these narrow projections were often utilized, small compartments being built upon them, too diminutive for human occupation and possibly used for storage. Fig. 1 exhibits such structures built on narrow sloping surfaces below.

The openings in the walls consist of peep-holes a few inches square, windows, and doors. The windows are not numerous, many rooms being entirely without them, while sometimes they are absent from the front walls of an entire village. They vary in size and shape, 18x24 inches being a large size, 12x14 inches a more common proportion. The sill consists of a single flat stone, the lintel of stone, or of one or two small cedar poles to give support to the wall of stone above. The doors have similar lintels, but the door sill is frequently absent. The size of the doors is also quite variable; they are almost always small, many requiring one to enter on hands and knees, and being barely wide enough to admit an adult person. Not an uncommon size is 2x3 feet. Yet doors five or six feet in height and

of ample width are met with in some houses. Some rooms have neither doors nor windows in the side walls, being entered through a hole in the roof—or floor of the next story. These roofs and floors are formed of cedar or piñon poles two to four inches in diameter, some of which were allowed to project a foot or two beyond the outer wall. They show that they were cut off with some blunt instrument, probably the stone axe. These larger poles were covered with smaller cross sticks, which were in turn covered with adobe cement; sometimes corn-stalks and strips of bark were pressed into the adobe while it was yet soft, as these articles are still found imbedded in it. Over this vegetable matter a series of layers of brown and black dirt is often found; whether originally placed there, or the accumulated filth from long occupation, is uncertain.

The floors between stories have usually fallen in, leaving the broken poles or the holes in the wall through which they protruded. The main walls of the buildings are from one to two feet in thickness, the partition walls somewhat thinner. The size and shape of the rooms vary greatly. They are usually small, 8x10 feet being a large room, 6x6 feet a more common size, while great numbers of little compartments about 3x4 feet are met with; sometimes they are nooks and corners left in completing the larger outlines of the building. The diminutive height of the rooms is also noticeable, four feet being a not unusual height. In the shape of the inner rooms less care is shown in their proportions than in the outer walls; the partitions being frequently out of parallel. The inner surfaces of the walls, in some cases, were simply chinked and the interstices plastered like

the outer wall ; many of the rooms, however, are smoothly plastered within, and impressions of the fingers and the palmar surface of the hand are occasionally visible. Finger marks are often found in the cement on the outer walls, and their small size has led some to infer that this was woman's work. The plastered walls have in some instances been smeared over with tinted clay of either a brownish or a pinkish hue. Mural decorations are exceedingly rare. A band in black around the upper part of the room has been observed, and occasionally rude attempts at sketching the human figure. Pegs of wood and staples of bent willow or reed let into the wall, are frequently found and probably served as projections on which to hang things. A special description is required of the circular rooms called "*Estufas*," from their resemblance to the circular chambers of this name found in the Pueblo towns. One or more of these structures are to be found in almost every collection of houses. They vary a good deal in size and manner of construction, but are always circular, with somewhat heavier walls than those of the adjoining buildings. They have few apertures. A diameter of eight or ten feet is not unusual ; much larger ones have been described, but still smaller ones are met with.

Fig. 3 exhibits the ruins of one of these structures, showing a projecting ledge or seat interrupted by a solid mass of masonry. Frequently rectangular recesses exist at intervals in the wall large enough to contain a person sitting with bent knees ; smaller recesses are also found. Fig. 3 shows one of them and also exhibits a smoother portion of the wall covered with plaster, as well as surfaces from which it has scaled.

These estufas were usually more perfectly plastered and tinted than the other class of rooms.

In the centre of the floor a shallow circular basin of baked clay from one to two feet in diameter, forming a solid part of the floor, represents a fire-place ; at least fragments and dust of charcoal are found in these basins. Some of the estufas have an aperture about a



FIG. 3

foot square, opening on the outer wall and screened within by a little wall of masonry built up from the floor about a foot or two from the wall ; whether this was to prevent persons outside from looking in, or for the purpose of distributing the draught, on account of the central fire-place, is uncertain. The interior walls of estufas are usually much blacker from smoke than are the other rooms. The entrance to these apartments is

sometimes difficult to discover; narrow subterranean galleries have been described by some writers, but roof openings and apertures high up in the walls were more common. A form of wall construction should be mentioned in which the wall is continued upward upon a few tiers of stone by wicker work, heavily plastered inside and outside with adobe. Concerning the number and grouping of the rooms in different villages as indicated by the ground plan, it may be said that they range from small collections of half a dozen compartments to those with more than a hundred. Richard Wetherill discovered an unusually large group of buildings which he named "The Cliff Palace," in which the ground plan showed more than one hundred compartments, covering an area over four hundred feet in length and eighty feet in depth in the wider portion. Usually the buildings are continuous where the configuration of the cliffs permitted such construction. Many towns present the appearance of having been added to from time to time, as the wants of the community increased. This is suggested by the different degrees of perfection in the masonry of adjoining buildings and by the better or poorer construction of upper stories. Isolated buildings are occasionally met with. Some of these, situated on spurs or promontories which overlook the valleys, have been regarded as towers of defence, or points of lookout. The valley ruins also exhibit the remains of large isolated round structures, sometimes with a double circular wall, and in the broad valleys are ruins with larger groups of apartments than those in the cliffs, showing a greater resemblance to the Pueblo towns. They probably represent different peri-

ods of architecture and were possibly the work of different tribes.

Within the cliff-houses, under the débris of fallen walls and in the refuse heaps about them, various articles have been found which throw further light upon the habits of the cliff-dweller. They may be enumerated and classified in the following manner. Those marked with an asterisk did not come under the writer's observation or verification. For their description and identification Mr. John Wetherill is the informant, and his careful observations may be regarded as trustworthy.

IMPLEMENTS FOR WAR AND THE CHASE :—Bows of wood ; \* sinew bow strings ; \* arrows of wood and of reed ; flint and bone arrow points ; flint and bone spear points ; flint and bone knives, of various sizes ; buckskin quiver with arrows ; \* snow shoes.\* Bows and arrows were found by the Wetherills in a sealed room beside the skeleton of a man dressed in a suit of fringed and tanned skins.

TOOLS FOR BUILDING :—Stone axes, polished and unpolished, of various sizes, shapes, and materials, chiefly of igneous rock. Fig. 4 exhibits one with polished edge, 6x3 inches ; stone hammers large and small. Both axes and hammers are frequently found with a short handle of wood bound to the stone by strips of yucca.

IMPLEMENTS FOR THE MANUFACTURE OF DOMESTIC ARTICLES :—Sticks about three feet long, knobbed at one end and worked into a blade at the other, supposed to have been used in beating and preparing the yucca fibre, as they have been found in rooms with bundles of yucca in different stages of preparation.\* Awls of turkey bone ; bone needles ; \* flat and rounded stones for

shaping pottery ; clay for pottery ; \* flat hide scrapers ; sharp sticks and paddle shaped pieces of wood thought to be agricultural implements ; sticks supposed to be part of a loom.\*

HOUSEHOLD UTENSILS.—Knives and spoons of bone ; stones for grinding corn (metate stones) ; hoppers of

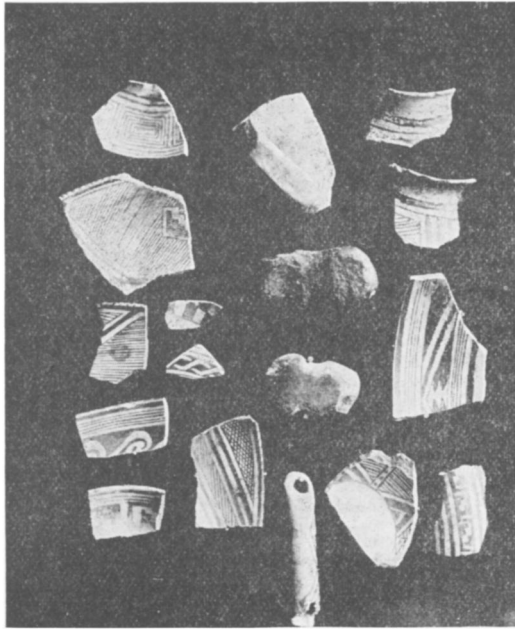


FIG. 4.

woven yucca ; stone pestles ; sharp pointed sticks for starting a fire ; \* tinder of bark and of grass ; baskets and fragments of basket work made of grass, yucca, rushes, reeds and willow. Baskets shaped for the back have been found with a harness of yucca rope and hide.\* Matting of rushes (see Fig. 5) and matting made of

willow osiers perforated at short intervals by small awl holes, through which yucca strings pass, holding them together and parallel. Rings of yucca and of rushes to support unstable pottery; the yucca plant in different stages of preparation for fibre; yucca rope, both twisted and braided forms, cordage, twine and thread; flat boards, supposed to be "baby boards." One was found with a bed of corn tops on it.\* Small bundles of stiff grasses tied in the middle and cut off squarely at both ends; said to be used to-day by the Moquis as hair-brushes or combs.

DRESS AND ORNAMENTATION.—Fragments of tanned hides bound with cordage of yucca fibre; fringed buckskin garments; leggings and cloth made of human hair; cotton cloth; cotton cord; yucca fibre cloth; finely woven bands of yucca fibre; socks made of yucca fibre; sandals of yucca with various styles of finish. Fig. 5 shows one exhibiting the heel and toe bands. Some sandals have an in-sole of corn husks, or of soft bark fibre. Feather Cloth: this peculiar textile was made by splitting off the downy part of feathers and wrapping the thin layer of quill around a yucca string, a feather cord as large as one's finger is thus formed, and this interlaced and tied together answered for a mantle, such garments having been found as a wrapping for the dead. Bone beads; snail shells perforated for stringing; jet and stone ornaments have been found.

POTTERY.—Large jars holding from one to several gallons, the so-called corrugated ware (indented ware, coiled ware). Fig. 5 exhibits in the largest fragment a specimen of this peculiar pottery; small jars are made of the same material, and their shapes vary. Much

speculation has been indulged in as to how they were made, some maintaining that they consist of strips of clay coiled spirally and indented with the finger-nail; others think that this effect is due entirely to nail indentation. As proof that the nail was used for indenting this ware, the writer has a fragment on which the deli-

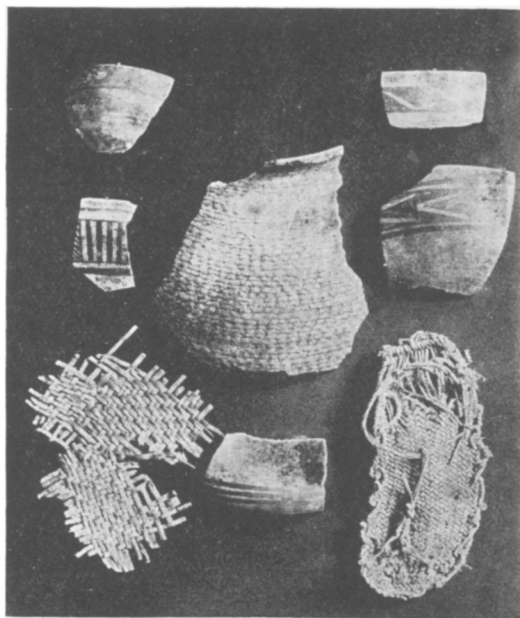


FIG. 5.

cate lines of the skin have been perfectly impressed below the nail marks. The inner surface is smooth. These jars are usually blackened from smoke, as if used for cooking utensils. They are of a coarser material than the smooth pottery, but comparatively thin, considering the size of the jars. Of smooth pottery a great

variety has been found ; jars large and small, jars with rims for lids, jar lids, jars with side handles, jugs, large and small, pitchers, bowls, mugs, ladles (see handle of ladle, Fig. 4) ; peculiar little pieces of pottery in which cotton wicking has been found, supposed to be lamps.\* Some of the pottery is unglazed and undecorated. The surface of the decorated pottery has a slight glaze upon it, which is in some specimens slightly absorbent. Figs. 4 and 5 show a variety of patterns on fragments. As they are evidently hand designs, the variations are very great.

Tons of fragments of this ancient pottery are scattered over the mesa and in the valleys, as well as in and around the cliff-houses. Either the makers were indefatigable potters, or else the race dwelt long in the land. In truth, we do not know whether they represent different periods, or whether the makers were of different races. That many of the designs are at least as old as the buildings is proved by the fragments, occasionally found imbedded in the adobe as chinking material. Less common are fragments of a red pottery without decoration, except peculiar streaks of black through it on the inner surface, and on the outer, indistinct patches of a dull greenish tint. Sometimes a mottled effect is evident. Holes have been drilled through the pottery in some instances, apparently after baking, and broken pottery was mended by tying a string through holes drilled in the fragments.

FOOD SUPPLY :—Maize or Indian corn ; the stalks, husks, tassels, silk, cob and kernel are frequently found. That some of this material is as old as the buildings is proved by the fact that the stalks were used in the con-

struction of the floors, being actually imbedded in the adobe ; cobs being also used to chink the walls with, an impression of the cob in the now hard adobe being found on detaching one from its bed. Corn husks on the cob, knotted or braided and bunched much as the Eastern farmer treats his seed-corn, are not uncommon. As already mentioned, the husks were used as in-soling for sandals and for the padding of other articles. The corn itself was small, a yellow variety, some kernels showing a small dent. The cob was also small and short, usually about three inches in length. Jars of shelled corn have been found, but when the kernels are obtained from refuse heaps or open vessels the softer part has generally been gnawed away by some rodent, leaving only the hard outer rim. Efforts to sprout the complete kernels, it is said, have thus far proved unsuccessful. Reddish-brown beans of fair size are frequently found. The stems, rind and seed of gourd-like vegetables of different kinds are abundant ; some thin like a gourd, others squash-like, and another kind resembling the pumpkin. A kind of walnut has also been found. The American turkey was evidently an important factor in the domestic economy of the cliff-dweller. His feathers and quills were used for ornament and dress, his bones were worked up into useful household utensils such as awls and needles, and we can hardly doubt but that his flesh formed an important article of animal diet, if we may judge from the broken bones in the refuse heaps. That this people did not merely hunt the wild turkey, but succeeded in domesticating it seems probable from the abundance of droppings, particularly in certain small compartments, with

which are mixed the down and feathers of this fowl. The droppings of smaller birds and different rodents are numerous under the cliffs, the accumulations of ages, but the arrangement, appearances and situation serve to distinguish them in many cases from the deposits just referred to. Deer bones, buckskins, sinews and horn show that one or more varieties of the cervidæ supplied these people with material for food, dress and utensils. The question will naturally arise in the mind of every reader of this list of articles found : How do we know that they belonged to the original builders and occupants of the cliff-dwellings and not to modern tribes, as so many of the articles resemble those known to be in use by Indian tribes ? The truth is, that in many cases we cannot feel sure, yet examples of most of the articles described have been found in situations or under conditions which show most conclusively that they are not recent, but as old as some parts of some of the buildings ; as in the instance cited of articles found imbedded in the mortar or under the ancient floors. Again, the uniformity of the findings over widely distant regions, wherever this class of buildings has been carefully examined, is strong confirmatory evidence ; yet too much care cannot be taken in reaching conclusions in this sort of work.

HUMAN REMAINS :—The burial mounds on the mesa contain the decayed remains of human skeletons in abundance, and many in a fair state of preservation, yet nothing but the bones remain except pieces of pottery buried with the body, these usually in fragments. When the attitude can be determined it is usually the flexed position, the body having been laid on the side. Skele-

tons are also found buried among the ledges, where occasionally under the protection of some large mass of rock sufficient earth has been retained in which a shallow grave could be excavated. The best preserved human remains are found in the dry material under the cliffs. An occasional place of burial was on or under the floor of some room in the building. Sometimes the body was simply laid away in the dry dust, the room being sealed; in other cases the earthen floor covering the body shows the accumulation and effect of use after the burial. Where absolute protection from moisture has occurred, mummified remains have been found with the wrappings of the dead, in a more or less complete state of preservation. Although comparatively few have been found, the uniformity of method in dress and attitude shows what was their favorite method of burial. The outer wrapping consists of the willow matting already described. It forms a kind of burial case. Beneath this is usually a covering of rush matting, and next to the skin a wrapping of fibre cloth, or a mantle of the feather cloth already described. The flexed position on the side is the usual one. The hair of the head has been found partly preserved on some mummies. It is said to be of fine texture, not coarse like Indian hair, and varying in color from shades of yellowish-brown to reddish-brown and black. The writer was not able to verify this by personal observation, as no mummies were exhumed during the trip, but the facts are vouched for by many observers. The Wetherills exhumed one mummy having a short brownish beard. It is possible that a bleaching process may account for the change in color, though this is doubtful; it certainly will

not account for the soft, fine texture of the hair. If this observation is corroborated in future findings, as they have been up to the present, an important ethnological fact will be established. A theory prevails in Colorado, which the writer was unable to trace to its originator, that three distinct races inhabited the land, the mesa dwellers with perfect skulls, the cliff dwellers with skulls having a perpendicular occipital flattening and the valley dwellers with skulls having an oblique occipital flattening. The theory is based on the fact that different shaped skulls have been found at these different situations. The number of skulls examined under the writer's observation were not sufficient to establish much; yet he saw skulls removed from the mesa mounds which, contrary to the theory, were examples of both horizontal, and oblique flattening. The cliff-house skulls were perpendicularly flattened, and all these flattened skulls were asymmetrical. The angle and plane of flattening vary in different skulls, so that it may be readily conceived that in a large number of skulls we might find intermediate grades from the perpendicular to the oblique forms. While the theory advanced may be correct, the objection to accepting it is, that it rests on the examination of too few crania. While there is no doubt of the preponderance of perpendicular flattening in the cliff-dwellers skulls, we are not justified in concluding that they were necessarily a different race from the valley peoples who flattened their skulls differently. Localities may be found to differ, and the question should be left undecided until a larger number of skulls have been examined and proper craniometric observations made upon them. The specimens of crania seen do not usually

impress one as of extremely low grade. They are brachycephalic but this is in great part due to the occipital flattening. The vault is well rounded, not sloping laterally like the crania of many Indian tribes. The teeth of adults are generally worn flat on the crown. The skeletons, while not exhibiting signs of unusual muscular development, as indicated by the rough points for the attachment of muscles and the curvature of the long bones, were yet well developed and of good stature. The mummy of a man found by the Wetherills measured 5 feet 10 inches, and that of a woman 5 feet 6 inches.

ROCK MARKING :—Attention has been called to the almost total absence of figures, decorative or otherwise, on the walls of the buildings. Rude characters, inscriptions and pictures are also very rare in the cañons of the Mesa Verde. A line cut in a spiral was the only object of the sort that came under the writer's observation; a photograph of this was lost by a faulty exposure. Their entire absence in so many of these more isolated villages should make us doubtful about the origin of those found on the valley walls, along lines of travel which modern tribes have used. Those found on high cliff walls, or at lower levels, consist of little more than a few crude attempts at picturing man and animals, impressions of the human hand, and attempts at geometrical figures, which rarely suggest that they could have been conventional signs of more than a local value.

Grooves in the sandstone, where stone implements have been ground and sharpened, may be seen on the ledges about almost every dwelling; broad, hollow grooves that would fit the larger axes, narrow lines

where probably a bone awl was ground, or other sharp implement.

At certain levels, in some cañons, bituminous shales and thin seams of coal appear. John Wetherill states that he has found coal cinders in the ash heaps and fire basins of cliff-towns near such out-cropping, and regards this as proof that they recognized the value of coal as fuel and utilized it.

Before discussing the prevailing theories concerning this peculiar and primitive people, it is desirable to consider the extent and geographical distribution of their architectural remains as already found. This will be best attained by giving a brief *résumé* of what investigators have accomplished.

When Coronado in 1541 made his celebrated expedition and invasion of the region now known as Arizona and New Mexico, he found in ruins the buildings called Chichilticale, supposed to be the "Casa Grande" of southwestern Arizona, described by Emory in 1846-47, Bartlett in 1854, and other writers since. The resemblance of these ruins to the cliff-town buildings and the ancient Pueblos shows that before the Spanish invasion allied architectural structures had been reared and occupied, deserted and partly demolished, at a period too remote for the native tribes then occupying the land to tell aught of the former builders or occupants. Although there are abundant references to the Moqui, Zuñi and New Mexican Pueblo towns in the early Spanish records and later accounts by traders and travellers, there are few positive allusions to the high cliff structures of the San Juan and its tributary cañons. Lieut. Simpson described in 1848 the Pueblo ruins of the

Chaco Cañon, in which cliff ruins were found in addition to the extensive valley ruins.

The matter attracted but little attention until Jackson in the summer of 1874 made a hasty trip through the Mancos Cañon, up the Aztec Spring Creek, and into the McElmo Cañon. In the summer of 1875 he continued his explorations in the McElmo and Hovenweep Cañons, and over the country nearly as far north as the Dolores River, finding numerous evidences of cliff and valley ruins similar to those of the Mancos. Other ruins were found along the San Juan and on Epsom Creek, also in the Montezuma Cañon. Crossing to the southern tributary cañons of the San Juan system, the ruins of the Rio de Chelly were visited and described. In 1877 he visited, described and illustrated in an admirable manner the ruins of the Chaco Cañon referred to by Simpson. One skull was discovered, afterward described by Dr. Hoffman. It had an oblique occipital flattening.

Holmes, in 1875-76, went over the ground covered by Jackson in the Mancos Cañon, part of the San Juan Valley, Aztec Spring Creek and the McElmo region. He summarized the result of the work in his report for 1876.

These three reports of Jackson and Holmes (see Hayden's Rep. U. S. Geo. and Geog. Survey for 1874-1876) have served as the basis of original observation and scientific authority for archæological writers since. Considering the brief time allotted to these investigations, their results were remarkably full. Holmes speaks of the hurried character of his trip, while Jackson refers to his journey through the Mancos as a "hasty

trip," and of his subsequent expeditions he remarks : "We can only expect to skim the surface, leaving to others hereafter the more satisfactory duty of exhausting each subject in detail." This "satisfactory duty," however, has never been done, either by the Government or any expert archæologist, so far as published records show. Fragmentary contributions have appeared in the writings of Newberry, in reference to the Dolores district, and of Major Powell, respecting the cliff-dwellings in the high walls of the Grand Cañon of the Colorado. Most of the remaining literature consists of popular newspaper and magazine articles, many of them containing excellent summaries of the matter (see an interesting narrative by Chapin of a trip to the Mesa Verde, *Appalachian*, May, 1890), but none representing investigations carried out according to modern scientific methods for ethnological and archæological research. Year after year, tourists and prospectors have visited one or another of the ruins described and carried away relics that could be found ; others recognizing their commercial value have made a business of forming collections for exhibitions or sale. The latter class, in consequence of the time devoted to the subject, have come into possession of a much greater number of facts than other observers, and have really done good work in preserving and bringing to light these relics. Yet it is unfortunate that their work was not done under competent archæological advice, upon a definite plan of investigation, by which many details, still remaining in doubt, would have been settled by the material already secured. Besides several small collections of relics that have been made, there is the one brought from the Man-

cos Cañon by Chas. McLoyd and purchased by the Denver Historical Society, and the very large Wetherill Collection already referred to, obtained from the Mancos and other cañons of the Mesa Verde after several years' labor. In the fall and winter of 1890, Chas. McLoyd and C. C. Graham visited the lower San Juan valley in Utah and the cañons to the west tributary to the Colorado, and, chiefly in Grand Gulch Cañon, made, it is said, the largest collection of cliff-house relics yet brought together. It was taken to Durango and sold to Rev. C. H. Green, who afterward organized a party with McLoyd as guide, to visit the region in which the collections had been made and obtain photographic views of the same. Through the kindness of Mr. Leeka, the photographer of the expedition, the writer obtained much valuable information. The impressions of this conversation are, that almost the same kinds of articles were discovered as those obtained from the Mesa Verde region, and very little additional that would tend to modify conclusions drawn from previous collections. On the other hand, the collection strongly corroborates former findings. Further proof of the use of cotton was furnished not only by the presence of cloth and cordage, but also by the raw cotton itself, in which were found cotton seeds. Some half-dozen mummies were exhumed, corroborating the manner of dressing and burying the dead, already described, as well as showing that the hair was of fine texture and of light color.

Finally, Mr. Lumholtz's unfinished investigations in the Sierra Madre Mountains of Mexico may be mentioned. They are already familiar to the readers of the

BULLETIN. His preliminary report seems to show that the same class of cliffs and cave dwellings exist in this region as are found in the districts already described ; about the same kind of relics have been found, and mummified remains presenting similar wrappings, the same attitudes and hair of fine texture.

It will be seen that the people who erected the cliff-houses were distributed over a considerable area, chiefly confined to the Colorado drainage area ; so far as known, mostly to its eastern tributaries, the San Juan and its cañon system having shown the principal collections of ruins. Yet many parts of Arizona present examples, and how far their structures extend to the south, in Mexico, still remains to be determined.

How perfect a picture can we construct of this ancient civilization from the fragments that remain? An outline only. These people were not workers in metals. Stone and wood, bone and horn, were the materials from which they formed their implements. Yet the two great primitive arts, weaving and the making of pottery, they had acquired, and their rude but substantial architecture, executed under conditions which must have required great patience, perseverance and considerable skill, indicate their attainments as stone masons and architects. The store of agricultural products, their corn, and beans, and squashes, show them to have been tillers of the soil as well. Their fixed habitations and their development of these arts differentiate them from the nomadic tribes. Yet all these qualifications fail to show that they had reached more than a low grade of development. Weaving is an art acquired by races very low in the scale, and the potter's art is also a very

early acquirement of primitive peoples. They were a race without a written language, and we have nothing by which to determine under what form of government they lived, their social regulations, or their religious beliefs. The estufas, it is thought by some, were places for religious ceremonies; this being suggested from the fact that the Pueblo Indians used their estufas for such purposes, but they also used them as council chambers, and some Spanish writers maintain that they were assembly rooms for males. The fact that they served any particular purpose in other societies is not proof that they were put to the same use by these primitive people. Notwithstanding their cultivation of the pacific arts, the hunter and the warrior still had important functions to perform. The skins and bones tell the story of the chase; the bow and arrow and spear represent implements with which to obtain food and maintain defence. It is presumable that resistance rather than aggression was their plan of warfare. The selection of such impregnable positions for their towns in the cliffs would seem to have no other reasonable object than that of defense. Holmes inferred that the valley ruins represent the permanent habitations of these people and that the houses in the cliffs were occupied for refuge in time of invasion only. In the light of subsequent examinations this theory appears highly improbable. The numerous signs of long continued occupation, the implements, products and refuse incident to the manufacture of dress and pottery, and to the obtaining of food by tilling the soil, as well as the substantial character of the buildings, together with their wide distribution far away from valley towns, are facts indicating permanent habitation.

Although it seems difficult to find any other reason for such seclusion than that of defence against surrounding warlike foes, yet we cannot deny but that, originating in this manner, subsequent generations may have acquired a fondness for these cañon fastnesses, these eagle nests, and continued to occupy them from habit and inclination rather than from necessity. Generations born and reared amid the surroundings that cliff life afforded, becoming adapted to the conditions, would probably be as well satisfied with the situation as primitive people usually are, and as dissatisfied if forced to abandon it.

To many, however, the great problem is, how the cliff dweller maintained his food supply. Admitting that he had corn and beans, where did he raise them? If a tiller of the soil, where did he find soil to till? A glance at the bare ledges around his habitation, at the distant cañon bottom far below, at the dry mesa above with its contracted water shed, does not reassure one that the answers are at hand. If we assume that the people of the broader valleys supplied them, with such a distant source of food supply we would have a very precarious situation in time of invasion; besides, it is hardly probable that if their corn was obtained in the distant valleys they would have carried along the cornstalks, so abundant in the houses. A favorite way out of the difficulty is to assume that, when these towns were built and occupied, the climate was more humid and cultivation of the soil easier than now. This is not only an unwarrantable assumption, but an unnecessary one as well. The perfect preservation of so many of these ancient ruins and their contents is accounted for

by their protection from moisture. How can we reconcile this with the existence of a humid climate during their occupation? What would have been the necessity of the numerous attempts at water storage, if the climate had not been an extremely dry one? On the mesa top, little gulches that incline toward the cliffs frequently show the remains of small dams of stone built across them at intervals of a few feet. These may have served as water tanks, filled during the heavy showers that fall in the summer, more probably they were terraces formerly filled with earth in which crops were planted. Winter snows and summer rains would keep them sufficiently soaked to insure the growth of a crop like corn or beans. At some periods of the year they may have been watered. Natural excavations in the rocks large and small so situated to receive a flow of water during rainfall and retain it seem to have been utilized, if we may judge from steps cut in the rocks about such places and attempts to build up the low part of a basin artificially. About the houses also devices for collecting and storing water are evident. The needs of each of these small communities were not so great that large areas of tillable land would be required, and the mesa, if the cliff-house was high, was the most available place for their small gardens; while for houses accessible from below, the cañon bottom could have been utilized. With attention to the collection of water in their larger cisterns and reservoirs, the snows of winter would have furnished them with a sufficient supply for a part of the year, while the torrents that fell in the summer would have enabled them to replenish their supply for other

portions of the year. Water storage was probably the great secret of the cliff dweller's ability to maintain himself in this arid region.

During the writer's sojourn on the mesa, in August, rain fell almost every day, and during some of the showers the streams that poured down the gullies were of considerable size. Those who know the power of torrential action as shown by a Colorado "washout," know that the so-called cloud-bursts of these dry plateau regions will accomplish a vast amount of erosive work in a very short time; so that it is unnecessary to assume a greater water power than now exists to account for the erosive action that has been going on for ages and is still going on in these regions.

Concerning the source of the cotton supply which this people had, it may be said that cotton was a comparatively rare article. The yucca fibre served as the fibre for almost all textile fabrics, and as raw cotton, wicking, string and cloth have been found more abundantly in the cliff-houses of the lower San Juan, near valleys of less altitude than those of the Mesa Verde, it is not improbable that the inhabitants of the latter region obtained it by some system of barter from the people of warmer valleys where it could be cultivated.

The interesting question as to the period at which this primitive civilization flourished has never been settled, and probably never will be. In the absence of written records, it is next to impossible to assign these architectural remains to their proper chronological place. There are no data by which the age of these stone structures can be determined. If they were found on the Atlantic seaboard with their contents in such a

perfect state of preservation, we would know that they must be very recent, for dead vegetable matter soon disappears in a climate of even moderate humidity. In the dry atmosphere of the region in which they are found, protected from rain by overhanging cliffs and covered with dry dust if undisturbed, they would probably remain unchanged for hundreds, if not for thousands of years.

The marked difference in the state of preservation between the ruins under the cliffs and those outside, which have been more exposed to the action of the elements, is suggestive of great age for both classes, and great differences in the age of ruins in different localities, as well as those under the same cliff, are suggested by their varied appearances and degrees of preservation.

Cliff caverns are found with marks in the rocks made by axe grinding, and having the foundations of former houses, but without the usual mass of stones that formed the upper walls. These had apparently been carried away to supply material for new houses in the vicinity.

As it is impossible to tell when any of these cliff-houses were erected, so it is also impossible to determine over how long a period this system of architecture and civilization continued. The well-known persistence in the habits of primitive peoples should make us cautious in assigning the beginning of their architectural works to too recent times; while on the other hand, we may err in assuming that the latest occupation of these cliff-houses was very remote. There is nothing unreasonable in the view that they were still occupied to some extent as late as the Spanish invasion, though there is no direct proof that they were. Most of the cliff structures

referred to by the Spanish invaders were Pueblo buildings at lower levels in the cañons, and not the high cliff-towns. Yet the transition from the stone cliff-house to the more modern adobe Pueblo is strongly suggestive that the latter are an evolution from the former: an adaptation to the wants of larger communities and to differences in situation and available building material. The Spaniards found Pueblo tribes, using many articles similar to these found to-day in the cliff-houses. The bow with a sinew bowstring, arrows and spears with flint and bone points, numerous articles of dress made from the yucca, including sandals, cotton fabrics, similar food material, such as corn, beans, gourds and domestic fowls, and pottery of various kinds. They had no implements of metal, they ground their corn on metate stones, and it is said they planted it early, so that the late snows on melting would water it. They had no written language. Surely this is not a very different picture from the one sketched above from the remains of the cliff dwellers, and it is difficult to resist the conclusion that one civilization was the outgrowth of the other. This does not prove, however, that the cliff dwellers were of the same race as the Pueblo tribes. Conquered or conquering races, may adopt the customs and methods of another race with which they have been brought in contact. The existence of a system of architecture among a people does not show that they were the originators of it, they may have been mere imitators and adaptors. There is little question that the inhabitants of the Pueblos as found by the Spaniards were made up of a variety of tribes. The spoken language of the different Pueblos showed such

radical differences that we must assume former periods in which they were more isolated. Considerable physical differences were also noticed. Some of the towns (presumably of the Moquis), had people who are described as having soft wavy hair and a "somewhat whitish skin." Here we have another link in the chain leading back to the mummified remains found in the cliff-houses. The question as to the race of the cliff dweller cannot be answered, but that we have in the Moquis of to-day an admixture of the ancient cliff dweller is not improbable. This does not in any way settle the origin of any of these tribes. The mingling of varieties of the human species may have gone on for thousands of years; wilder tribes amalgamating with the more pacific ones, one community acquiring control of or partly destroying others, towns left in ruins, the earlier traces obliterated, leaving no clue as to the origin of the people or when the country was first occupied.

H. H. Bancroft has done good service in showing the insufficiency of the historical, architectural and linguistic evidence in favor of the popular theory of the migration of tribes from New Mexico and Arizona to those regions of Mexico, in which are found the great architectural remains of the Mayas and the Nahuas; or the reverse theory, that the Pueblo tribes are the offspring of a northern migration from these regions. While admitting the possibility of the unity of these races in the extremely remote past, there is not sufficient evidence to show that their civilizations had any influence on each other. Whence came the race with pale skin, soft hair, and flattened skull? This question will probably never be correctly answered.